(12) UK Patent Application (19) GB (11) 2 071 279 A

(21) Application No 8007682
(22) Date of filing 6 Mar 1980
(43) Application published
16 Sep 1981
(51) INT CL³
F16K 11/04 B08B 3/02
(52) Domestic classification
F2V K3
(56) Documents cited
GB 1272530
GB 1072909
GB 834574
(58) Field of search
B2F
F2N
F2V
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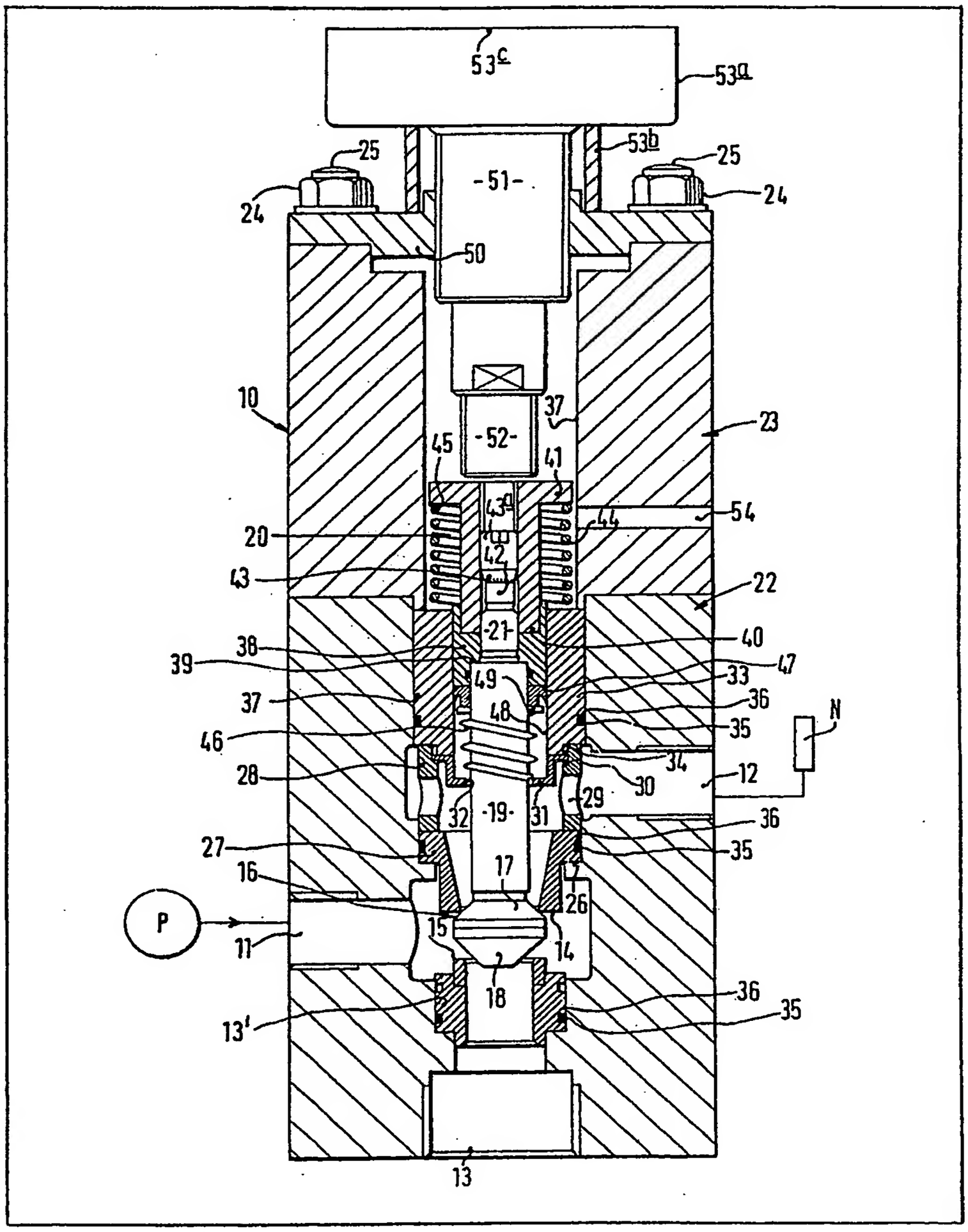
(54) Combined anti-dribble and dump valve

(57) In high pressure water-jetting equipment, flow of water to the nozzle (n) is controlled by a valve (10) having two seats (14), (15) either of which can be engaged by a common valve member (16). The valve member is urged into engagement with seat (14) by a spring (44) to pump fluid to outlet 13 and is moved from that seat by air pressure acting on a diaphragm (53*c*) when a pilot valve is actuated. The valve (10) is connected by a flexible hose with a gun comprising the nozzle (n).



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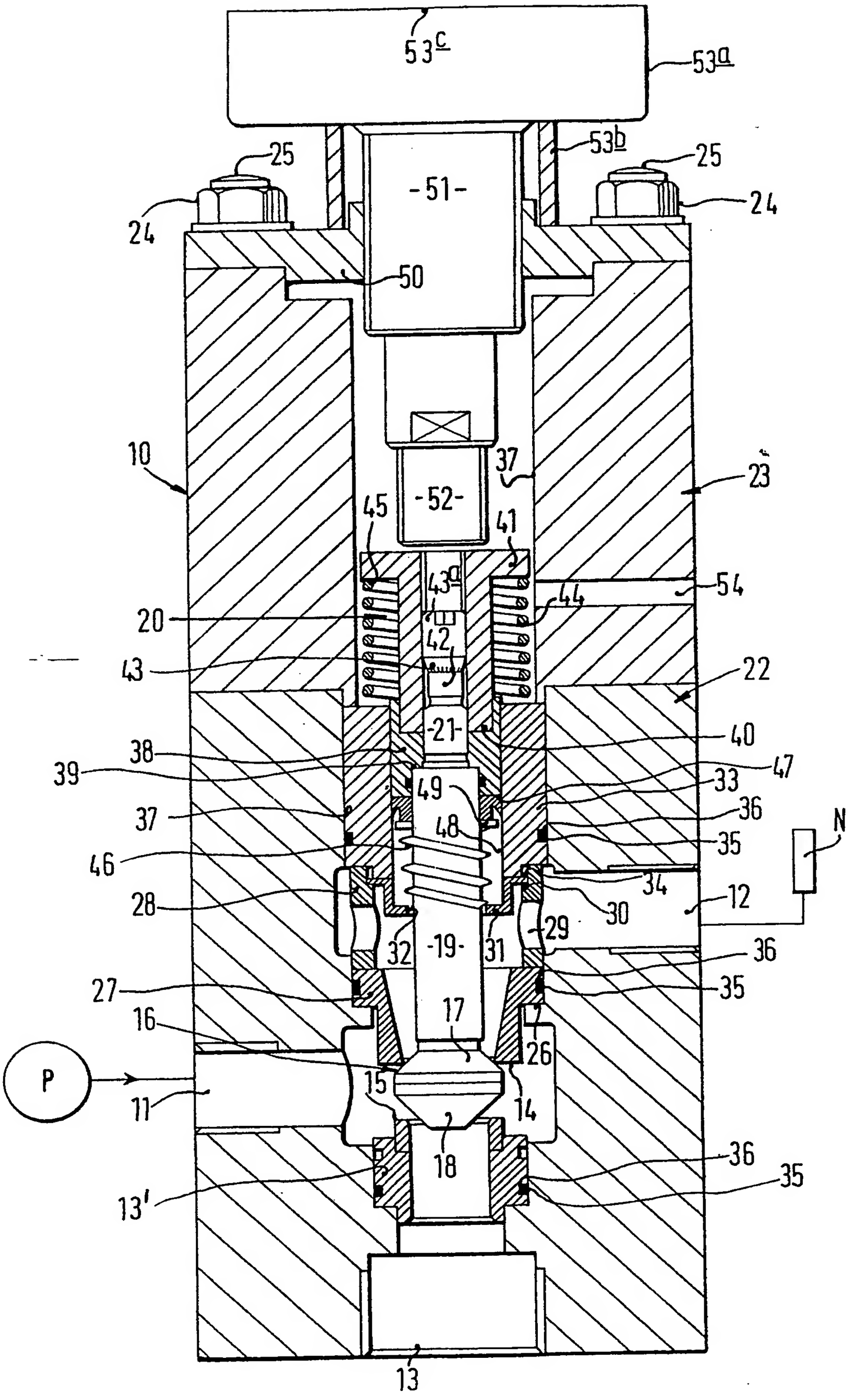
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SPECIFICATION

Combined anti-dribble and dump valve

This invention relates to a combined anti-dribble and dump valve for use in controlling high pressure fluid such as is used for the hydroblasting of castings.

Dump valves are known which comprise a cylinder having an inlet and first and second outlets, the first outlet communicating with a hose which supplies fluid to a gun which has a control valve. The second outlet communicates with a reservoir or other dump to which fluid may be directed when the control valve of the gun is closed so that a dangerously high pressure does not build up in the hose or gun and so that the pump is not strained. Thus it is not necessary to stop the pump when high pressure fluid is not required at the gun.

There is a first valve seat located between the inlet and the first outlet, and a second valve seat between the inlet and the second outlet. A dump valve member is provided in the cylinder and is adapted to engage the second valve seat when the control valve of the gun is opened thus closing the dump outlet so that the fluid is supplied to the gun, and a floating valve member is provided to engage the first valve seat when the control valve of the gun is closed and thereby trap fluid under pressure in the hose.

The valve members are both controlled by the pressurised fluid trapped in the hose connecting the gun and the first outlet, and a spring means which normally biases the valve member into engagement with the second valve seat. The high pressure fluid trapped in the hose between the floating valve and the control valve of the gun tends to leak through the control valve of the gun thus allowing fluid to dribble from the gun.

The emission of fluid from the gun whilst an operator is positioning a workpiece before the gun is undesirable. If the pressure in the hose falls substantially, owing to leakage through the control valve of the gun, the pressure will be insufficient to hold the dump valve member well clear of the second valve seat, dumping of the pumped fluid will be restricted and high pressure fluid will be applied to the gun via the hose. A cyclic variation of pressure in the hose will thus be established and this gives rise to doubts as to whether it is safe for the operator to move into a position before the gun.

It has also been proposed to connect a dump valve by means of a hose with a gun which is itself devoid of any valve for controlling the flow of fluid through the hose and the gun. This proposal does not overcome the problem of fluid dribbling from the gun because the fluid in the hose is subject to sufficient pressure to cause some flow of fluid along the hose and through the gun.

According to the invention we provide apparatus which includes a source of high pressure fluid, a nozzle which, in use, directs a high pressure jet of fluid to a workpiece, and a combined anti-dribble and dump valve wherein said valve includes an inlet connected with said source, a first outlet connected with the nozzle, a second outlet, a valve member engageable in a first position with a first valve seat to prevent communication between said inlet and the first outlet and engageable in a second position with a second valve seat to prevent communication between the inlet and the second outlet, and control means for controlling the valve member.

Thus, the need to provide separate anti-dribble and dump valves is avoided. The second outlet may lead to a reservoir for the fluid or to a point of use other than said nozzle.

Preferably, the control means comprises a resilient means which normally biases the valve member into engagement with the first valve seat, and a movable control member which acts in opposition to the resilient means to move the valve member into engagement with the second valve seat.

The control member may be movable by a diaphragm acted upon by compressed air. With this arrangement, the air pressure controls the degree of opening of the valve with respect to the first outlet and thereby the rate of flow of fluid of the nozzle.

The compressed air may be selectively supplied by an air line and valve, and the valve may be located adjacent the gun or nozzle so that an operator of the gun or nozzle can both control the combined anti-dribble dump valve and direct the jet from the gun or nozzle.

It will be appreciated that as the valve member is normally biased into engagement with the first valve seat that if the diaphragm fails, the high pressure fluid supplied to the gun or nozzle will be cut off and the fluid directed to the dump outlet. Thus by arranging the valve member to be normally biased into engagement with the first valve seat a high degree of safety is achieved.

The invention will now be described with reference to the accompanying drawing which is a sectional view of a combined anti-dribble and dump valve according to the invention.

Referring to the drawing, there is shown a combined anti-dribble and dump valve comprising a valve body 10 having an inlet passage 11 for connection to a high pressure fluid supply such as a pump P (shown diagrammatically), a first outlet 12 from the body 10 which is connected to a hose (not shown) which carries fluid from the valve body 10 to a gun or nozzle N (shown only diagrammatically) which directs a high pressure jet of fluid at a workpiece such as a casting, or an ingot mould for example, to remove scale and other debris.

The valve body 10 also has a second dump outlet 13 to which pumped fluid may be directed when it is no longer desired to provide a jet of fluid from the gun or nozzle, whilst changing the position of the gun or nozzle, or the workpiece. Thus it is not necessary to stop the pump or otherwise disconnect the fluid supply to the valve.

A first valve seat 14 is located between the inlet 11 and the first outlet 12, and a second valve

seat 15 is located between the inlet 11 and the second dump outlet 13. A valve member 16 is provided which has two frustoconical seat faces 17 and 18, the face 17 being adapted to engage the first valve seat 14 in a first upward position as seen in the drawing, and face 18 being adapted to engage the second valve seat 15 in a second downward position. A control means hereafter described, is provided to move the valve member into the first and second positions.

The valve member 16 has a cylindrical body part 19 which extends upwardly from the seat 17 into a cavity 20 of the valve body 10, the part 19 having a smaller diameter threaded portion 21 adjacent its upper end. The cavity 20 extends throughout the valve body 10, the body of the valve 10 comprising two concentric hollow cylindrical parts 22 and 23 connected together by a plurality of nuts 24 which engage studs 25 which are threadedly engaged in blind bores (not shown) in part 22 and extend through larger diameter plain bores in part 23.

In the cavity 20 of the valve body 10 adjacent the inlet passage 11, there is provided an inwardly projecting peripheral lug 26 which is engaged by a shoulder of a sleeve 27, the sleeve 27 providing at its lower end the first valve seat 14. Abutting the sleeve 27 is an annular ring 28 having apertures 29 therein through which fluid may pass to the first outlet 12. The ring 28 has a rabbetted end 30 which locates a depending guide member 31 having a central aperture 32 through which the body part 19 of the valve member 16 extends.

A hollow cylinder 33 is also received in cavity 20 and has a step formation 34 at its lower end which engages both the ring 28 and the guide member 31.

Sealing rings 35 are provided in slots 36 in the sleeve 27 and cylinder 33 to provide a seal between inner wall 37 of the cavity 20 and the sleeve 27 and cylinder 33.

Located in the hollow cylinder 33 is an annular slider part 38 which is counterbored at its lower end to provide an abutment for step 39 between the body part 19 of the valve member 16 and the smaller diameter threaded portion 21 thereof. The slider part 38 is also counterbored as shown at 40 to receive and abut a boss 41 having a female threaded bore which is engaged with male threaded portion 21 thus locking the slider part 38 firmly in position.

The smaller diameter male threaded valve member portion 21 has a still smaller diameter plain cylindrical end 42 with a cup seal 43 attached thereto and expanded into sealing engagement with the inner threaded wall of the boss 41, by an insert 43*a* which is screwed into the upper end of the bore of the boss 41 to lock the portion 21 in the boss by establishing friction between the cooperating threads.

The boss 41 has a resilient means comprising a compression spring 44 received thereon, one end of the spring 44 abutting a shoulder 45 of the boss 41, and the other end abutting the upper end of the hollow cylinder 33.

Thus the valve member 16 will be normally biased upwardly into a first position wherein the face 17 of the member 16 engages the valve seat 14 of the sleeve 27 to prevent flow of fluid to the nozzle N. In use, fluid will pass from the inlet 11 to the second dump outlet 13.

The second dump outlet 13 has an annular insert 13′ mounted therein which has a sealing ring 35 received in a slot 36, the annular insert 13′ providing the second valve seat 15.

A further compression spring 46 is provided to maintain a seal 47 in sealing engagement with slider part 38, and inner wall 48 of the hollow cylinder 33 to prevent fluid from passing from the inlet 11 to the upper part of the cavity 20. To achieve this, an annular washer 49 is provided on the body part 19 which is urged by one end of spring 46 into engagement with the seal 47, the other end of the spring 46 engaging the guide member 31.

Located above the boss 41 in the cavity 20 of the valve body 10 and mounted in an end cap 50 which is also retained in position by the studs 25 and nuts 24, is a cylinder 51 having a control member comprising a tongue member 52 slidable therein. A housing 53*a* mounted on a support collar 53*b* connected to the cap 50, is attached to the cylinder 51, the housing 53*a* having a diaphragm 53*c* therein which is mechanically connected to the tongue 52. When the diaphragm 53*c* is depressed, the tongue member 52 moves downwardly so that it abuts the upper end of boss 41. Further depression of the diaphragm 53*c* results in further downward movement of the tongue 52 which will move the boss 41 downwards against the force of the compression spring 44, and bring face 18 of the control member 16 into engagement with second valve seat 15. Thus fluid will pass from the inlet 11 to the first outlet 12 and hence to the gun or nozzle where a jet of fluid is directed to the workpiece.

The diaphragm 53*c* is depressed by compressed air which may be supplied to the diaphragm 53*c* by an air line and valve, the air valve preferably being located near to the gun or nozzle so that an operator can both direct the jet of fluid to the workpiece and control the dump valve to supply or cut off the fluid supply to the gun or nozzle when required. By subjecting the diaphragm to air pressure which is sufficient to move the valve member 16 off the seat 14 but not to engage the valve member with the seat 15, fluid received from the pump P can be divided, some fluid being directed to the nozzle N and some fluid being directed through the pump outlet 13. By adjustment of the air pressure, the rate of supply of fluid to the nozzle N and therefore the pressure at the nozzle N can be varied as required.

To admit air into the cavity 20 in the valve body in the region of the boss 41 and tongue member 52 so that downward movement of the tongue member 52 is not inhibited by pressure build up in the cavity 20 in this region, an air breather passage 54 is provided in the valve body part 23. Emission of liquid from the passage 54 indicates

leakage at the seal 47.

Although the control means described comprises a cylinder 51 having a tongue member 52 slidable therein, if desired any other means may be provided to move the valve member 16 against the force of the resilient spring 44, so that face 18 of the control member 16 is engaged with the second valve seat 15.

Further it is within the scope of the invention to provide any other control means whereby the valve member 16 can be moved between said first and second positions.

It will be appreciated that as the supply of fluid to the gun is not controlled by a valve in the gun as in previously known arrangements, pressurised fluid is not trapped in the hose connecting the first outlet 12 and the gun or nozzle, and thus the tendency for fluid to dribble from the gun, is eliminated.

CLAIMS

1. Apparatus which includes a source of high pressure fluid, a nozzle which, in use, directs a high pressure jet of fluid to a workpiece, and a combined anti-dribble and dump valve wherein said valve includes an inlet connected with said source, a first outlet connected with the nozzle, a second outlet, a valve member engageable in a first position with a first valve seat to prevent communication between said inlet and the first outlet and engageable in a second position with a second valve seat to prevent communication between the inlet and the second outlet, and control means for controlling the valve member.

2. Apparatus according to Claim 1 wherein the control means comprises a resilient means which normally biases the valve member into engagement with the first valve seat and a movable control member which acts in opposition to the resilient means to move the valve member into engagement with the second valve seat.

3. Apparatus according to Claim 2 wherein the control means further comprises a flexible diaphragm adapted to be acted upon by compressed air and arranged for moving the control member.

4. Apparatus according to Claim 1 wherein the combined anti-dribble and dump valve is substantially as herein described with reference to and as shown in the accompanying drawing.

5. Any novel feature or combination of features herein described or disclosed in the accompanying drawing.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

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